

Non Invasive Instrumentation For Single Event Effects (NIISEE), Phase I

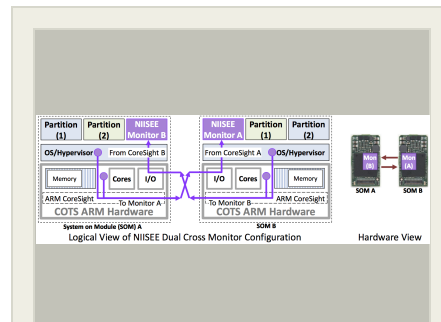
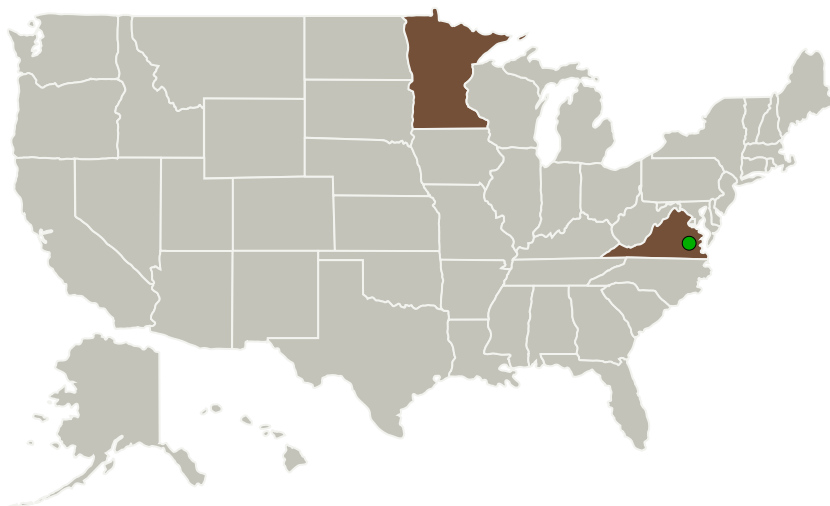
Completed Technology Project (2015 - 2015)



Project Introduction

On this Phase 1 project, Adventium will identify and address key hurdles to achieve Radiation Hardening by Software (RHS) for Single Event Effects (SEEs) for modern COTS processors. The primary benefit this approach will be to reduce the time and cost to deploy new space-based capabilities by leveraging power efficient, pervasive mobile computing processors. These processors, however, are not explicitly hardened against radiation (rad-hard) and, consequently, can accumulate uncorrected faults which violate time and space partitioning requirements and lead to mission failure. Current rad-hard space-based processors are custom components, predominantly used only by the aerospace community. They are costly and have limited capabilities and longer product refresh cycles compared to COTS processors. These factors contribute to a high barrier for entry for organizations who can contribute to and participate in Science Mission Directorate (SMD) missions, further impacting innovation. We will define requirements for, and establish the technical feasibility of Non Invasive Instrumentation For Single Event Effects (NIISEE), a cross-checking architecture that leverages built-in debug features in mobile COTS processors. NIISEE will detect transient and permanent SEEs in a space-based environment, while providing high availability and mission critical functionality. Our key innovation is to provide run-time, low-level, non-intrusive fault detection by repurposing a debug capability that already exists in fielded devices. This debug capability is far more capable than Joint Test Action Group (JTAG) scan chains, and is intrinsic in modern Advanced Reduced Instruction Set Architecture (RISC) Machine (ARM) embedded processors. While intended for debugging embedded applications and System On Modules (SOMs) during development, the logic blocks remain on-die in fielded devices.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Adventium Enterprises, LLC	Lead Organization	Industry	Minneapolis, Minnesota
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Minnesota	Virginia

Project Transitions

▶ **June 2015:** Project Start

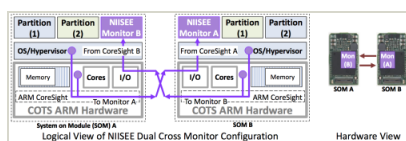
✓ **December 2015:** Closed out

Closeout Summary: Non Invasive Instrumentation For Single Event Effects (NIISEE), Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139284>)

Images



Briefing Chart Image

Non Invasive Instrumentation For Single Event Effects (NIISEE), Phase I
(<https://techport.nasa.gov/image/127380>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Adventium Enterprises, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

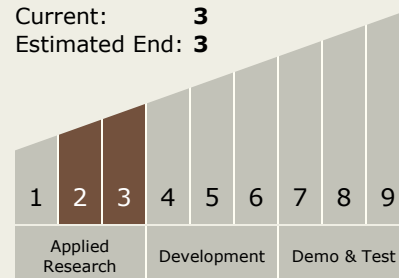
Carlos Torrez

Principal Investigator:

Todd Carpenter

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Technology Areas

Primary:

- TX02 Flight Computing and Avionics
 - └ TX02.1 Avionics Component Technologies
 - └ TX02.1.6 Radiation Hardened ASIC Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System